difficult to organize. Existing farm units seldomly are large enough to support the investment into a tractor. The eviction of tenants by landlords intending to owner-operate their land in large units remains an exceptional event: for once, the share of tenants is small, secondly, tenancy arrangements cannot easily be terminated against the (violent) resistance of tenants. In the following, therefore, analysis will be restricted to the impact of bio-chemical innovations on labour supply and demand in the sectors of the rural economy.
It has been shown that, in a neo-classical profit function, technical progress can be represented by a decrease in factor prices[17]. Technical change increases the efficiency of factors involved in the agricultural production process: labour, modern inputs, land, and fixed capital. Logically, it is the same to say that the marginal product of a natural factor unit increases, or that the price of an efficiency unit decreases. In a comparative-static analysis one might approximate technical change by a discrete decrease in factor prices.

4.1 Labour Supply

A decrease in factor prices increases profits, i. e., income accrueing to fixed production factors. This will be the only effect on household income, as the natural wage rate remains unaffected. The effect of an increase in household income on labour supply is completely symmetric to the effect of a decreasing household income caused by population growth which was analysed in chapter 2.1. The same argument applies to the other sources of income growth relevant in the Paktia case: increase in grain prices, windfall profits from forestry, expansion of high earning positions in the public service, distribution of food under the World Food Programme.
Population growth and growth of income per head, thus, have adverse effects on labour supply. Labour force growth and growth of income per head affect labour supply in the same or in the opposite direction depending on the inferior, normal or superior status of household goods.

4.2 Labour Demand in the Agricultural Sector

The proportional decrease of all factor prices increases the demand for each factor by its profit share[18]. If, however, technical change increases factor efficiencies disproportionally, the change in the efficiency factor price ratio has to be taken into account. Bio-chemical innovations are likely to increase the efficiency of modern inputs (fertilizers and HYV seeds) more than labour efficiency. In the most convenient case of the elasticity of factor substitution being unity, there would, then, only be the positive effect of an additional decrease in the price of modern inputs on profit and on labour demand. There is, however, evidence, that the elasticity of substitution between labour and modern inputs is considerably

[17] Lau, L. J., Some Applications of Profit Functions. Stanford: Research Center in Economic Growth, Memorandum No 86-A, November 1969, page 45 (Forthcoming in McFadden, D. [ed.], An Econometric Approach to Production Theory. Amsterdam: North-Holland).
[18] The solutions offered in this chapter have been developed algebraically in Gerken, E., Statisches Modell ... (see footnote 3).

below unity both in the short and in the long run[19]. Labour and inputs like fertilizers and HYV seeds are partly complementary in agricultural production. A relative decrease in the price of modern inputs, therefore, must further increase the demand for agricultural labour[20].

4.3 Derived Labour Demand

Agricultural innovations, increasing grain prices, and the transfer income from the selling of wood and from the distribution of food under the World Food Programme increase total and per capita income of agricultural households. As mainly average- and large-sized farm units participate in the modernization process, the additional income generated by improved technology more clearly than income from the other sources accrues to upper class households. Outside the agricultural sector, the same is true with respect to additional wage income generated by the expansion of public services.

Analysing data from the "All-India Consumer Expenditure Survey", Mellor and Lele calculate that rural households in the bottom 2 deciles of income ranking spend only 22 per cent of an incremental income on nonagricultural commodities while, in the upper half of the tenth decile, the figure is 66 per cent[21]. The nonagricultural share in incremental expenditure is continuously rising with income ranking. If the figures can be shown to reflect a typical trend in other economies as well, they lead to a simple conclusion: Agricultural innovations will the more increase demand for nonagricultural goods and, thus, derived labour demand in nonagricultural sectors, the more skewed the distribution of additional income is. In case the economy knows only the dichotomy of labour intensive agricultural and capital intensive nonagricultural production, the conclusion for the total employment effect likewise is clearcut: Income growth will the less increase total employment, the more skewed its distribution is. The result is, however, less obvious if a large share of nonagricultural commodities is produced in a labour intensive rural nonagricultural or urban nonindustrial sector.

Expenditure survey data, so far, are not broken down according to sectoral origin of the goods and services consumed. Elsewhere, it has been argued at length that sound empirical knowledge on income and price elasticities of goods pro-

[19] Evenson, R. E., Labor in the Indian Agriculture Sector: A Report to USAID. New Haven: Yale Economic Growth Center, October 1972.

[20] This is the same as saying that technical change is "labour-using". According to Hicks, technical change is neutral if it leaves the ratio of factor payments constant. Under conditions of technical change increasing the efficiency of two factors (factor augmenting technical change), neutrality occurs whenever the augmentation coefficient (= rate of efficiency increase) is equal for both factors and/or the elasticity of substitution is unity. In the present case, with the efficiency increase being higher for modern inputs than for labour and the substitution elasticity being below unity, technical change has a labour-using bias.
Drandakis, E. M. and Phelps, E. S., A model of induced innovation, in: Economic Journal, 1966, page 823–840.

[21] Mellor, J. and Lele, U., Domestic Markets and the Growth of Farm Cash Income. Paper presented at the Conference on Strategies for Agricultural Development in the 1970's. Stanford University, December 1971.

duced in the household, in a rural nonagricultural, an urban nonindustrial, an industrial, and an import sector is needed to approach the question of changing sectoral shares in labour force and value output during the phases of economic development[22]. The "decline" or "rise of rural industry" in the course of economic development is still largely a matter of faith and predilection.

The data on Paktia do not allow to further advance this argument. They do, however, provide some hints on the aspect of substitutionality between rural and urban industrial goods. The regional increase in demand for a certain good translates itself into a derived demand for regional labour only in case the regional market is closed. If the product price remains unaffected, profit maximizing firms see no reason to increase their output. Increasing demand simply leads to increasing imports. The market for rural nonagricultural goods can be regarded as closed, at least for isolated areas like Paktia. Increasing demand would increase product prices, output, and labour demand in the nonagricultural sector. Rural nonagricultural goods do, however, differ in the degree to which they can be substituted by urban industrial goods in consumption. The elasticity of substitution is likely to be higher between rural and urban industrial goods than between rural services and urban industrial goods.

Other things being equal, the argument leads us to expect the derived demand for labour to grow more rapidly in the rural service subsector than in the rural industrial subsector. The table shows that this, in fact, did happen in Paktia in the period observed. Excluding the special case of the ethnically distinct barbers, labour demand in the rural service subsector has been rising by about 6.3 per cent p. a. between 1343 and 1350. In the same time, labour demand in the rural industrial subsector increased by about 3.2 per cent p. a. only.

The result has only an exploratory value. The income elasticities of goods and services produced by rural nonagricultural occupations are not known. If rural service goods have a consistently higher income elasticity of demand than rural industrial goods, the explanation offered becomes redundant. Still other alternatives for explanation are open: i. a., exogenously determined differential changes in product prices or differential technological innovations in rural service and rural industry occupations. A research project on the role of the labour intensive "third" sector in economic development will have to test these among other hypotheses.

4.4 Other Indirect Effects on Employment

The wage rate for unskilled labour is not determined on the regional level. It is, however, of interest to shortly contemplate in which way agricultural innovations would, on a national or even international level, affect wage rates. One can, then, sketch the effect changing wage rates for unskilled labour have on the sectoral distribution of labour force and value output.

Agricultural innovations increase per capita household income. In the more likely case of a normal or even superior aggregate Z-good this would increase the de-

[22] Gerken, E., Zur Theorie der dualistischen Entwicklung. Arbeitspapier Nr. 5. Berlin: Institut für Sozialökonomie der Agrarentwicklung, Oktober 1973.

mand for household goods and, thus, decrease labour supply. At the same time, agricultural innovations have been shown to increase agricultural labour demand. Other things being equal, both must lead to an increase in the wage rate for labour[23].

An increase in the wage rate increases labour income and decreases profit income. The total effect on household income may be positive or negative. For both cases, chapter 4.3 spells out the likely solutions.

An increase in the wage rate, unlike other changes in income, also changes the (shadow) price of Z-goods. As household goods are a function of labour, their price increases relative to the prices of other consumption goods. Depending on the partial elasticities of substitution between household goods and each of the other goods consumed by the household, the demand for other goods will increase and generate an additional derived demand for labour. Unlike agricultural goods, urban industrial and rural nonagricultural goods are close substitutes to household goods like, f. ex., processed food, clothes, furniture, washing machines, personal services. Derived demand for labour, therefore, will mainly arise in the urban industrial and in the rural nonagricultural sector unless, of course, consumption goods are imported. The total employment effect depends on the (differential) partial elasticities of substitution between household goods and capital intensive industrial/labour intensive rural nonagricultural goods. Again, for rural households empirical knowledge on which to base meaningful generalizations has yet to be achieved by research.

5. Summary and Tentative Conclusions

The paper offers several arguments on the relation between population and labour force growth, increasing agricultural productivity, and employment in the rural nonagricultural sector. The solutions developed are strictly explorative in character and need empirical research to be substantiated. Labour force growth directly increases labour supply. Population and labour force growth, on balance, decrease per capita income. Depending on the inferior, normal or superior status of household goods the decrease in per capita income will increase or decrease labour supply. On the side of labour demand, open markets for products and factors prevent an immediate effect on demand, but rather lead to changes in migration of unskilled labour and in unemployment of skilled labour.

Bio-chemical innovations in the agricultural sector increase household income and thus increase or decrease labour supply depending on the status of household goods. As innovations tend to increase upper class income more rapidly than lower class income, the different mix of household goods in income classes affects labour supply as well. Bio-chemical innovations directly increase the demand for other production factors, including labour, in the agricultural sector. By increasing household income, they additionally have a derived demand for labour effect.

[23] Agricultural Innovations have been shown to have adverse effects on labour supply and labour demand in the Indian case.
Yotopoulos, P. A. and Lau, L. J., On Modeling the Agricultural Sector in Developing Economies: An Integrated Approach of Micro and Macroeconomics. Memorandum No 148. Stanford: Food Research Institute, June 1973.

In case lower class households receive the main share of additional income the derived demand for labour will mainly arise in the agricultural sector. This would also maximize total employment in a dual economy with a labour intensive agricultural and a capital intensive industrial sector. In the more likely case of the additional income going mainly to upper class households, the employment effect crucially depends on the distribution of consumption expenditure between urban industrial, rural industrial and rural service goods.

On a national economy level agricultural innovations are, under specified conditions, likely to increase the wage rate. An increase in the wage rate also increases the shadow price of household goods leading to a substitution of these goods against urban industrial and rural nonagricultural goods. The total employment effect depends on the differential partial elasticities of substitution between household and urban/rural consumption goods.

The arguments of the paper were mainly concerned with market forces. In the Paktia case, this reflects reality more closely than in other regions of LDCs having a more development minded political system than Afghanistan in the period observed. In no case, however, the description of market forces implies that the author wishes to advocate political nonintervention. As policy measures were not the topic of this paper, the following must be a rather rough summary of policy conclusions:

1. A policy placing heavy emphasis on total employment should foremost try to increase the participation of small farmers and tenants in the introduction of bio-chemical innovations. Selective provision of seeds and fertilizers, collective provision of complementary inputs (water), extension work, tenancy control, special credit and marketing facilities for small farmers, are some of the instruments open for development policy.

2. Development policy should try to improve the competitive position of the rural against the urban industrial sector. On the urban side, this relates to the well-documented problems of distorted factor prices and of the social costs of urban agglomerations. On the rural side, which is of more interest here, vocational training, transfer of labour-using innovations, collective provision of complementary inputs (power station), credit and marketing facilities for small entrepreneurs, cooperative ventures, allocation of public contracts, reduction of information costs are but a few of the instruments open for a policy of rural development.

3. Most of the second generation problems afflicting other Green Revolution areas, so far, have not shown in Paktia. This is mainly due to the relatively homogenous land tenure system of the province. However, tenancy eviction, mechanization beyond the point of actual labour replacement, decreasing real income of landless wage labourers may arise in future, if the present trend of a rapid increase in tenancy arrangements in some pockets of the province pursues. Loss of transfer income formerly obtained from forest exploitation, salineation, and a sudden reduction in water supply, in some areas decreased the income of farmers and forced those at the lower margin to obtain credit for consumption purposes. Credits usually are mortgaged with land and, on failure to repay, ownership rights are transferred to the creditor. Government intervention in the fragmented capital market which, at present, is heavily discriminating against small lenders, is the most immediate policy measure asked for.

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Population, Agricultural Productivity, and Employment in the Rural Nonagricultural Sector: Interpreting Observations in Paktia/Afghanistan

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The ever-increasing literature on population and employment in LDCs has repeatedly drawn attention to a "third", i.e., nonagricultural and nonindustrial sector.[1] The employment "problem" is usually stated in an agriculture – nonagriculture framework. Economic development is, in the long run, concomitant with a declining labour force share of the agricultural sector. The rapid growth of population and labour force in economies still showing a high agricultural labour force share, then, requires improbably high rates of growth of the nonagricultural labour force. Growth arithmetic gives an understandable appeal to the assumed "labour absorptive capacity" of a "rural nonagricultural" or an "urban nonindustrial" sector.

So far, however, only a few descriptive studies on the rural nonagricultural sector have been published which allow for little, if any, generalization.[2] This might explain why, apart from an occasional attempt in model building, a consistent theory on the structure of this sector, its linkages with other sectors, and its role in economic development has not yet been proposed.[3] There still seems to be a need for the explorative discussion of data in terms of development theory.

In 1971 the author administered several socio-economic surveys in the Afghan

[1] See especially the country reports on the employment situation published by the International Labour Organization:
Towards Full Employment. A Programme for Columbia Prepared by an Inter-agency Team Organized by ILO. Geneva: ILO 1969.
Matching Employment Opportunities and Expectations. A Programme of Action for Ceylon Prepared by an Inter-agency Team Organized by ILO. Geneva: ILO, 1971.
Employment, Incomes, and Equality. A Strategy for Increasing Productive Employment in Kenya. Geneva: ILO 1972.
Sharing in Development: A Programme for Employment, Equity and Growth for the Philippines. Geneva: ILO, Forthcoming.

[2] For a comprehensive introduction into ongoing research see the recent progress report of the World Employment Programme. ILO, World Employment Programme: A Progress Report on its Research – oriented Activities. Geneva: ILO, December 1973.
For a more specific overview over studies on the rural nonagricultural sector see
Liedholm, C., Research on Employment in the Rural Nonfarm Sector in Africa. African Rural Employment Paper No. 5. East Lansing: Michigan State University African Rural Employment Study, April 1973.

[3] Zarembka, P., Toward a Theory of Economic Development. San Francisco: Holden-Day Inc., 1972, chapter 3.
Gerken, E., Statisches Modell der ländlichen Wirtschaft eines Entwicklungslandes. Berlin: Institut für Sozialökonomie der Agrarentwicklung, Arbeitspapier Nr. 7, Januar 1974.

province of Paktia designed to collect information for project planning purposes.[4] The data obtained are in no way sufficient to estimate meaningfully specified labour supply and labour demand functions of rural sectors. They do, however, allow for some tentative reasoning about the growth of employment in the rural nonagricultural sector and its relation to population and labour force growth and to the introduction of bio-chemical innovations into agricultural production under the conditions of a specific land tenure system.

In chapter 2 we shall sketch some features of the rather unknown Afghan province southeast of Kabul at the border to Pakistan. Chapter 3 verbally describes a static model of the rural economy which has been developed in mathematical terms elsewhere.[5] Chapters 4 and 5 relate employment growth in the nonagricultural sector to population and labour force growth and to the introduction of bio-chemical innovations in agriculture. Chapter 6 summarises the results and draws some tentative conclusions for policy.

1. Paktia in 1350 (1971/72)

Paktia has a resident population of 630,000 on an area of 15,700 km^2. Twice a year about 150,000 nomads pass through the valleys of this mountaineous border province on their way between the Indus plain and the Hindukush. The average annual rate of growth of the resident population amounted to 2.5 per cent during the last five year period. Whereas the life birth rate remained fairly constant at 45 per 1,000, the crude death rate dropped to 20 per 1,000 during the past ten years. In the period to come population growth rates can be expected to increase to roughly 2.9 per cent. The growth rate of the potential labour force (males between 15 and 59 and females between 15 and 54 years of age) at present is 2.2 per cent but will eventually close up with the population growth rate. This prognosis does, however, not account for net outmigration which at present amounts to 25 per cent of total population p.a. Although reliable figures could not be obtained, outmigration seems to respond to increasing wage rates for migrant workers in Pakistan and in the Gulf states.

With few exceptions, both residents and nomads are organised into segmentary tribes belonging to the Pashtu-speaking stock of people living on both sides of the Afghan-Pakistan border. Integration into the nation states is not completed as some subtribes effectively abstain from government control. The tribal structure has been described as acephal and anarchic[6]. This only holds true on the village level in the sense of the absence of clearly defined leadership roles between basic social units. The basic social (not economic) unit is the extended family, i.e. the community of a couple with its unmarried children and its married sons and their

[4] Gerken, E., Grundlagen und Empfehlungen für eine Perspektivplanung zum Regionalen Entwicklungsvorhaben Paktia/Afghanistan. Bd. 7/II: Sozialstruktur, Beschäftigung und Agrarverfassung. Frankfurt: Bundesstelle für Entwicklungshilfe, 1971 (Unveröffentlichtes Gutachten für den Bundesminister für Wirtschaftliche Zusammenarbeit).

[5] Gerken, E., Statisches Modell ... (see footnote 3).

[6] Sigrist, C., Pashtunvali. Unpublished typescript.

nuclear families. The solidarity norms of this unit are most clearly marked by the obligations of blood revenge which, in Paktia, do not extend to the lineage. On the subtribal and tribal level roles of arbitrator and representative are clearly defined even in mountain tribes. In the valleys which, among them, comprise more than 2/3 of the population, national integration has effectively imposed a judicial and an administrative structure. However, comparing the Paktia social system to other tribal systems, one cannot be but impressed by an extreme form of "family egoism" which seriously hinders communal action in, f. ex., road building[7].

The economic (production and consumption) unit in Paktia is the nuclear family, ideally consisting of a father, his wife (wives), and their unmarried children. This unit is occasionally extended by not more than one married son and his dependents, a distant relative and an unmarried agricultural worker on a share labour contract. The size of the unit varies widely between 2 and 20 members with an average of 8.9 members and an average male working force of 1.9.

The land tenure system is still relatively homogenous. Close to 90 per cent of the holdings are owned and operated by peasant families, the rest by tenants. Landless wage labourers account for only 4 per cent of the male agricultural labour force. Farm size distribution, however, is more skewed with the upper 5 per cent of farms operating on 25 per cent of the irrigated land and the lower 65 per cent on 20 per cent only. Unlike the Indian and the Pakistan Punjab, the "second generation problems of the Green Revolution" in Paktia are less a question of functional income distribution between landlords, tenants and landless labourers but rather between big and small farmers[8]. Small farmers mostly do not see fit to participate in the potential productivity increases offered by the seed-fertilizer-mechanization-extension package of agricultural development.

On labour force participation, the first fact to note is that apart from animal husbandry the gainful employment of women is virtually unknown. The following figures refer to the male population only. 51.7 per cent of the male population are in the 15–59 years age bracket of which 88.9 per cent are gainfully employed, 7.5 per cent are students and other "willing" Non-Participants while 3.6 per cent can be classified as openly unemployed. Open unemployment, in the sense of able bodied persons actively seeking work at the going wage rate and not being employed over a certain period, is rare in homogenous agrarian societies. The "unemployed" usually have a claim to a labour income from the family farm. With the expansion of the educational system Paktia has witnessed the phenomenon of schoolleavers failing in their search for qualified occupational positions and refusing to accept any kind of unskilled agricultural or nonagricultural employment instead.[9] As schoolleavers have a claim to the rental income accrueing to their

[7] The term "family egoism" is freely adopted from a study on the social structure of Southern Italy.

Banfield, E. C., The Moral Basis of a Backward Society. Chicago: The University of Chicago Press, 1958.

[8] Falcon, W. P., The Green Revolution: Generations of Problems. In: American Journal of Agricultural Economics, December 1970.

[9] For a treatment of the schoolleaver problem in another Asian context see the ILO country report on Ceylon (see footnote 1).

share of the family land, they are able to follow a strategy of intertemporal income maximization by continuing the active search for a higher paying position[10].
Turning now to the "rural non-agricultural sector", the survey showed that 14.8 per cent of the labour force can be classified as being mainly employed in this sector with an additional 3.4 per cent gaining a subsidiary labour income from it. These figures do not include the public service (2.5 per cent in main and none in subsidiary employment) and the forest industry (5.1 per cent in main and 11.3 per cent in subsidiary employment). Number employed and wage rates in the public sector are almost completely determined outside the province. Forestry is a rather special feature of Paktia. With increasing wood prices in neighbouring. Pakistan and an abortive attempt of the Afghan Government to control the use of the forests, the cutting of wood has dramatically increased to the point of a final deterioration of the reserves. Forests are said to be a collective property of the subtribes. In practice, they have been divided between lineages which in turn allocated them to the nuclear units. Of 10,400 "woodcutters" counted in the survey, 74 per cent were classified as "mainly farmers". One might, therefore, justifiably treat income obtained from the sale of wood as a kind of transfer income accrueing to a minority of rural households in Paktia. In doing so, we abstain from problems of labor allocation in those pockets of the province where farmers still actively exploit their forest.
The following table groups all (main and subsidiary) nonagricultural workers into a public service sector, a rural service sector with 9 occupational groups, and a rural industry sector with 11 occupational groups. Additionally, activities directly or indirectly related to forestry (woodcutting, -milling, -transporting, and shepherding) are merged into a "forestry" sector. The data are based on a survey – covering all villages of the province – in which key informants were interviewed for each village. The table gives the total number of workers per group/sector in 1350 (c. 1) and the average annual rate of growth of employment between 1343 and 1350 (c. 2). Employment growth figures are based on recall data and should, therefore, be taken as rough indicators only. Columns 3 to 7 show the rather close connection between agricultural and nonagricultural sources of income in rural households. Analysing, f. ex., expenditure behaviour of rural households, it would make little sense to differentiate between agricultural and nonagricultural households. Column 3 gives the percentage of workers owning land, the other columns inform on the distribution of usufruct rights. Only in a few cases, land is not operated by either the household itself or by members of the larger social unit.
Reliable data on production and income are not available. Between 1343 and 1350 physical agricultural production probably increased very little in per capita terms as the influence of the new technologies was offset by two extremely dry years. Nevertheless, there has been a marked rise in agricultural income accounted for by increasing grain prices, the distribution of wheat and other food items

[10] The theory of job search costs has been proposed by the "new microeconomics" of labour (Phelps et al.) and has been transferred to problems of LDCs by Todaro, Harris Phelps et al., E. S. et al., Micro-economic Foundations of Employment and Inflation Theory. New York 1970.
Todaro, M. P., A Model of Labour Migration and Urban Unemployment in Less Developed Countries. In: American Economic Review, March 1969.

Table 1:

Structure of Nonagricultural Economic Activity in Paktia 1350

Sector	Occupational Group	Workers	Employment growth in % and p. a. 1343–1350	Land Owners in % of Workers	Land Utilization in % of Land Owners: Owner-operators with Family Labour	Owner-operators with Wage Labour	Non-owner Utilization by Family Members	Non-owner Utilization by Tenants
		1	2	3	4	5	6	7
Public Service		3,096	11.0	95	4	11	79	6
Rural Service	Transport Contractor	196	12.3	89	1	2	97	–
	Driver/Cleaner	1,507	8.7	83	5	11	82	2
	Wholesaler	1,226	9.1	90	22	8	64	6
	Cattle Trader	450	7.1	77	33	5	50	12
	Retail Trader	1,663	7.1	90	35	6	56	3
	Repair Mechanic	274	15.8	76	8	21	66	5
	Barber	1,072	1.0	9	70	7	20	3
	Mullah	2,071	1.4	55	45	13	39	3
	Water-distributor	379	0.4	81	61	–	36	2
	Total/Average (excl. barber)	7,766	6.3					
Rural Industry	Baker	97	5.1	69	34	21	45	–
	Tanner	458	3.2	85	24	11	59	6
	Carpenter	1,461	5.0	92	41	5	50	4
	Tailor	1,977	5.2	91	49	5	41	5
	Miller	882	0.1	67	77	–	23	–
	Bricklayer	171	4.7	83	50	6	44	–
	Mason	2,568	4.0	85	53	8	44	2
	Blacksmith	632	2.0	62	59	2	35	4
	Butcher	200	5.2	90	46	7	38	4
	Weaver (buria)	5,400	1.9	97	89	–	11	–
	Other	2,224	3.6	74	60	4	35	1
	Total/Average	16,070	3.2					
Forestry		21,904	2.9	86	63	6	28	3

under the World Food Programme, and by a sudden rush in the exploitation of the forest reserves. Additionally, nonagricultural income increased through the rapid expansion of relatively high earning positions in the public service, due mainly to the build-up of the technical aid project but also to some other government activity, notably in road construction.

2. A Microeconomic Framework for Interpretation

Let us think of a rural economy with an agricultural, a nonagricultural, and a public service sector. The agricultural sector produces a homogenous good (grains) and uses two variable factors (labour and modern inputs) and two fixed factors (land and fixed capital). The nonagricultural sector is divided into two subsectors.

The rural industrial sector produces a homogenous good which, essentially, is also produced in the urban industrial sector, although there might be quality differences (shoes, shirts, furniture). The rural service subsector produces a good which can only be provided locally and, thus, faces a closed market (the services of a trader or a repair mechanic). Both subsectors use only one variable and one fixed factor. Output supply and demand in the public service sector, finally, are completely determined exogenously.

In both the agricultural and the nonagricultrual sector firms can be regarded as pricetaking and profit maximizing economic units[11]. For the single firm prices are exogenously determined variables. Microeconomic analysis will not take into account the effect a change in population, labour force, or the efficiency of inputs has on product or factor prices. Provided, however, that microeconomic relations can be aggregated meaningfully, the change in equilibrium prices can be determined on the macro-level which, then, also allows for the analysis of "secondary" effects. The equilibrium price on an unregulated market is the market clearing price equalizing supply and demand. Unregulated markets are assumed for food, urban and rural industrial goods, rural service goods, and for labour while the price for modern inputs is set by the Government.

On the consumption side, it is assumed that the household maximizes its utility, which is a function of a total budget constraint and the consumption of food, urban and rural industrial goods, rural services and household goods. Household goods, the so-called Z-goods, comprise tangible items (like furniture and clothing) as well as more intangible items (like participating in social activities, educating one's children) which are produced in the household for own consumption[12]. Z-goods do not enter a market although they may be substituted by goods and services obtained from a market. For simplicity, we shall regard them as a linear function of time (Tz) devoted to their production. The wage rate, then, serves as a shadow price. Total working time (Tv) of a household is given by the number of household members in different age and sex categories multiplied by the category-specific norms of working time. Once the demand for Z-goods is determined, labour supply (L) is given by the equation $L = Tv - Tz$.

For simplicity we shall assume that in all rural households total income equals total expenditure, i. e., no savings are made. Total income is composed of profits (income accrueing to fixed production factors), potential labour income (total available working time multiplied by the wage rate) and the balance of obligations and transfer income. The budget is divided up between expenditure on market

[11] The assumption of profit maximization has, with an adjustment for risk avoidance, repeatedly been shown to hold for peasant farms in LDCs. See, i.a.
Wise, J. and Yotopoulos, P. A., The Empirical Content of Economic Rationality: A Test for a Less Developed Economy. In: Journal of Political Economy, November 1969.

[12] The basic references on Z-goods models are:
Becker, G. S., A Theory of the Allocation of Time. In: Economic Journal, September 1965.
Hymer, S. and Resnick, S., A Model of an Agrarian Economy with Nonagricultural Activities. In: American Economic Review, September 1969.
See also a paper by this author: Gerken, E., An Alternative Approach to the Theory of Labour Supply in LDCs. St. Paul: Department of Agricultural Economics, University of Minnesota, Staff Paper P 73–18, July 1973.

consumption goods, the consumption of own-produced food (valued at market prices) and of household goods (shadow-priced at the going wage rate).

Consumer preferences differ according to income class. Assuming a two class system, lower class households have a high income elasticity of demand for basic foodgrains and other "necessities". Upper class households, on the other hand, show a high Engel elasticity for processed food, personal services, and urban or rural industrial goods. The effect of an overall rise in income on the sectoral distribution of final consumption demand and, thus, of derived labour demand will differ according to the share of additional income going to upper or lower class households respectively.

3. Population and Labour Force Growth

Population and Labour Force growth are dynamic concepts which need to be operationalized for comparative-static analysis. In terms of our simple model, population growth is represented by a discrete increase in total household time (T), labour force growth by a discrete increase in total working time available to a household. Both influence labour supply and demand.

3.1 Labour Supply

The supply equation shows that an increase in Tv will translate into a more than proportional increase in L whenever the demand for household goods and, thus, for Tz stays constant. However, population and labour force growth are unlikely to leave the demand for Z-goods unaffected.

For the household, an increase in Tv results in an increase in potential labour income. At the same time, the rise in T diminishes income per head. On balance, income per head decreases if the percentage change in T is higher than the percentage change in Tv. This applies to the Paktia case.

A change in income affects demand for all consumption goods including those produced in the household. Under conditions of linear homogeneity, income elasticity for each good is unity. Total demand for each good would then increase and per capita demand decrease proportionally. Expenditure shares would remain constant. In this case, the framework offers a unique solution: Per worker demand for household goods decreases with decreasing per capita income. Labour supply per worker, therefore, increases. Both the direct effect (increase in Tv) and the indirect effect (decrease in Tz) work in the same direction.

Linear homogeneity, however, is not an acceptable assumption in consumer theory. A change in per capita income, usually, will also change the expenditure shares of different goods. In case of falling income, the demand for "superior" goods decreases in absolute and in relative terms ($E > 1$), the demand for "normal" goods decreases in absolute but increases in relative terms ($O < E < 1$), and the demand for "inferior" goods increases in both absolute and relative terms ($E < O$). Only in the case of superior Z-goods, therefore, an increase in labour supply per worker is assured. In all other cases labour supply per worker might also decrease and,

in the extreme, even swamp the increase in labour supply due to the increase in total working time available.

The comparative-static result crucially depends on the empirical status of household goods. Very little is known on this[13]. Intuitively, one would expect a household faced with decreasing per capita income to return to the home production of clothes, bread, and other goods hitherto obtained from a market. At the same time, one would expect the household to reduce the time input into social activities, education of children, or outright leisure to allow for increased working time in gainful occupations. Accepting such an intuitive classification of mostly inferior tangible and mostly superior intangible household goods, one is, then, confronted with a problem of weighting the aggregate household good. Without further data, one can only speculate. One line of specultation refers to the share of intangible goods in upper and lower class households. Upper class households more often than lower class households are liable to social norms of avoiding manual work for wives and daughters and granting young men a "moratorium of youth" in which "to find their own way"[14]. This would lead to the hypothesis that a decrease in income will more/less rapidly increase or less/more rapidly decrease labour supply when occuring in upper/lower class households.

3.2 Labour Demand, Migration and Unemployment

On the level of a single firm, an increase in total time and in working time available to the household has no immediate impact on the demand for labour. This feature of our framework is a direct consequence of our specification of an open and unregulated rural labour market[15]. In the Paktia case, this is, indeed, a realistic assumption. In subsistence-type economies where labour will not find employment outside the family firm, an increase/decrease in labour supply is always equal to an increase/decrease in labour demand at decreasing/increasing marginal products of labour. With a rural labour market, however, the labour demand of a price taking and profit maximizing firm depends on the wage rate, other factor prices, product prices, and the quantities of fixed factors only. Prices are determined exogenously.

To determine the impact of population and labour force growth on labour demand, one must turn to the macro level. In a closed economy and under conditions of unregulated product and factor markets, a determinate solution arises in the case of an overall increase in labour supply. In this case, wages would decrease while product prices would increase due to increasing product demand. Both would increase labour demand. In the less likely case of an overall decrease in labour supply the solution remains indeterminate.

[13] A comprehensive empirical study on Z-goods, so far, has only been done in Israel. Gronau, R., The Intrafamily Allocation of Time: the Value of the Housewife's Time. In: American Economic Review, September 1973.

[14] Rosenmayr, L., Hauptgebiete der Jugendsoziologie. In: König, R. (Hrsg.), Handbuch der empirischen Sozialforschung, Bd. II. Stuttgart: Ferdinand Enke Verlag, 1969, S. 65 ff.

[15] A rigorous proof is given in: Jorgenson, D. W. and Lau, L. J., An Economic Theory of the Agricultural Household. Tokyo: Econometric Society paper, 1969.

An analysis of the Paktia case along these lines would, however, badly approximate reality. The labour market in Paktia cannot be regarded as regionally closed nor can the market for agricultural goods. Interregional migration and movements of grains happen on a large scale. Wage rates are heavily affected by the demand for migrant labour in Pakistan, grain prices by Government policy on food import. Only for rural nonagricultural goods closed markets are an acceptable assumption. The effect on labour demand in the rural nonagricultural sector shall be analysed for the symmetric case of increasing income in chapter 4.3. With factor and product prices remaining unaffected, an increase in total labour supply can only lead to an increase in outmigration. Fluctuating rates of interregional (mostly international) migration are, in fact, reported by Government officers and German experts living in the province, although not documented in a reliable way. The argument as given refers to unskilled labour only. Skilled labour faces a more peculiar market on which wage rates are more often than not set by Government policy, labour union activity, and decisions of foreign firms. Increasing labour supply at constant or rising wage rates is more likely to meet with unemployment. International migration, mostly, is not a viable alternative.

4. Agricultural Innovations

The introduction of bio-chemical and mechanical inputs led to dramatic increases in agricultural productivity in some suitable climatic regions of the world. In Paktia, a German technical aid project since about 1964 offers, on a large scale, a package of subsidized modern inputs (fertilizers and HYV seeds of wheat and maize) and extension to farmers while, on a small scale, experimenting with the introduction of mechanical inputs. Farm adoption rates in 1350 varied between 5 per cent in remote mountain areas and 40 per cent in a main valley richly endowed with water, the average rate for Paktia being 23 per cent. On tenant holdings as well as on very small farms the average adoption rate was below 10 per cent. Small farms and tenant holdings on fragmented capital markets face problems in obtaining the credit necessary to buy modern inputs at the beginning of the season. Additionally, for tenant holdings the well-known problems of reaching an agreement on sharing additional input costs and value output between landlord and tenant apply[16].

Due to events on the national economy level, the increase in grain production on participating farms met with increasing grain prices, securing a marked increase in income for these average- and large-sized farms. In 1350 Paktia witnessed only a few of the second generation problems of mechanization afflicting the Green Revolution areas of India and Pakistan. Tractor hire services prove rather

[16] In a very concise analysis Stephen Cheung has questioned the economic foundations of the long established belief that share tenancy necessarily inhibits modernization of agriculture. In the long run, Cheung's analysis of the rationale of landowners and tenants probably is correct. In the short run, however, information costs and the problem of reaching a common decision cause a time lag in adoption between tenant and owner operated holdings.

Cheung, S. N. S., The Theory of Share Tenancy. Chicago: University of Chicago Press, 1969.
Hanumantha Rao, C. H., Uncertainty, Entrepreneurship, and Sharecropping in India. In: Journal of Political Economy, May/June 1971.